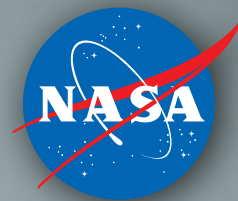


National Aeronautics and Space Administration



GoddardView

Volume 10 Issue 8
July 2014



GoddardView

THE WEEKLY

Goddard Employee Engagement Activities

Employee Engagement Activities

Goddard's employee engagement activities are on July 15, 16 and 17, all employees can experience exclusive opportunities to see a new side of Goddard. To see the entire schedule, visit the Goddard Employee Engagement Activities [website](#).

Astronomers Bring The Third Dimension to a Star's Outburst

A team of astronomers has used extensive new observations to create the first high-resolution 3-D model of the expanding cloud produced by the eruption of Eta Carinae that ejected at least 10 times the sun's mass. Click the image to learn more.



Testing Completed on Webb Backplane

NASA's James Webb Space Telescope has reached another development milestone with the completion of static load testing of its primary mirror backplane support structure moving the telescope one step closer to its 2018 launch. Click the photo for more info.

STEREO Enters New Operations Stage

Since February 2011, NASA's STEREO mission has been providing unprecedented views of the far side of the sun. The satellites are about to enter a new phase of their journey: a time when the bright light and heat of the sun will stand in the way of sending data back to Earth. Discover more by clicking on the image.



GoddardView

The Weekly – 2

NASA Cargo Launches to Space Station aboard Resupply Mission – 3

NASA's Newest Near Earth Network Antenna Is Operational – 4

NASA's High-Flying Laser Altimeter to Check Out Summer Sea Ice and More – 6

Goddard Zymurnauts Engineer More Than Just Spacecraft – 8

NASA MESSENGER and STEREO Measurements Open New Window Into High- Energy Processes on the Sun – 9

NASA Satellites Capture Arthur – 10
Outside Goddard: Andrew Wohl – 12

On the cover: Filled with over 3,000 pounds of supplies for the International Space Station, the Orbital Sciences Corporation Antares rocket launches from Pad-0A with the Cygnus spacecraft onboard on Sunday, July 13, 2014, from NASA's Wallops Flight Facility in Virginia. Photo credit: NASA/Bill Ingalls

GoddardView Info

Goddard View is an official publication of NASA's Goddard Space Flight Center. Goddard View showcases people and achievements in the Goddard community that support Goddard's mission to explore, discover and understand our dynamic universe. [GoddardView](#) is published by Goddard's Office of Communications.

You may submit contributions to the editor at john.m.putman@nasa.gov. Ideas for new stories are welcome but will be published as space allows. All submissions are subject to editing.

CONTENTS



NASA CARGO LAUNCHES TO SPACE STATION ABOARD RESUPPLY MISSION

By: [Rachel Kraft](#), [Dan Huot](#) and [Keith Koehler](#)

A multitude of NASA research investigations, crew provisions, hardware and science experiments from across the country is headed to the International Space Station aboard Orbital Sciences Corp.'s Cygnus spacecraft. The cargo craft launched aboard Orbital's Antares rocket from NASA's Wallops Flight Facility in Virginia at 12:52 p.m. EDT Sunday, July 13, 2014.

The mission is the company's second cargo delivery flight to the station through a \$1.9 billion NASA Commercial Resupply Services contract. Orbital will fly at least eight cargo missions to the space station through 2016.

The Orbital-2 mission is carrying almost 3,300 pounds of supplies to the station, which will expand the research capability of the Expedition 40 crewmembers. Among the research investigations headed to the orbital laboratory are a flock of nanosatellites designed to take images of Earth, developed by Planet Labs of San Francisco; and a satellite-based investigation called TechEdSat-4 built by NASA's Ames Research Center in Moffett Field, California, which aims to develop technology that will eventually enable small samples to be returned to Earth from the space station.

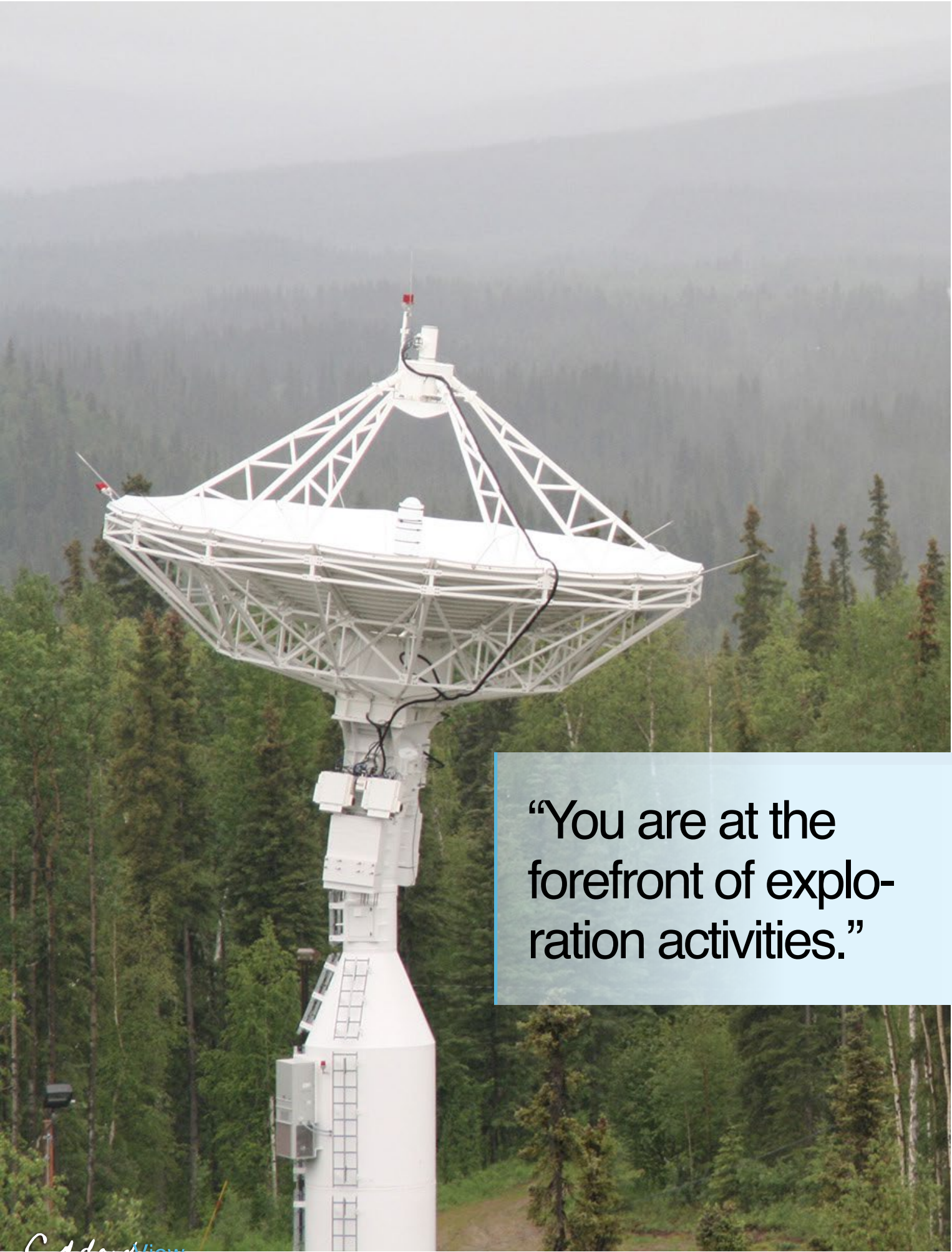
An experiment managed by Ames called Smart Synchronized Position Hold, Engage, Reorient Experimental Satellites (SPHERES) features a sensor and multiple cameras to enable 3-D mapping and robotic navigation inside the

space station. In addition, a host of student experiments are on board as part of the Student Spaceflight Experiment Program, an initiative of the National Center for Earth and Space Science Education and NanoRacks.

Expedition 40 Commander Steve Swanson of NASA, with help from Alexander Gerst of the European Space Agency, will use the station's robotic arm to take hold of Cygnus at 6:39 a.m. Wednesday, July 16. In August, the capsule, which will be filled with trash, will depart the station and burn up during reentry in Earth's atmosphere.

The International Space Station is a convergence of science, technology and human innovation that demonstrates new technologies and makes research breakthroughs not possible on Earth. The space station has been continuously occupied since November 2000. In that time, more than 200 people and a variety of international and commercial spacecraft have visited it. The space station remains the springboard to NASA's next great leap in exploration, including future missions to an asteroid and Mars. ■

Above: Orbital Sciences Corp. rolls out the Antares rocket to Virginia's Mid-Atlantic Regional Spaceport Pad 0A in preparation for launching its Cygnus cargo spacecraft to the International Space Station. Photo credit: NASA/Brea Reeves



“You are at the
forefront of explo-
ration activities.”

NASA’S NEWEST NEAR EARTH NETWORK ANTENNA IS OPERATIONAL

By: [Dewayne Washington](#)

A ribbon-cutting ceremony near the base of the new NASA antenna within the Alaska Satellite Facility marked the official beginning for the Near Earth Network (NEN) asset. Operated by the University of Alaska, Fairbanks (UAF), the facility is a prime polar location for NASA and part of its globally distributing ground-based network providing communication services for orbiting spacecraft.

“You call this area the final frontier,” said Badri Younes, deputy associate administrator for [Space Communications and Navigation](#) to the Fairbanks crowd gathered for the ceremony. “At NASA, we see you as the first frontier because you are at the forefront of exploration activities. To everyone who worked to make this a reality, thank you. You have a special relationship with NASA, and we want to continue working with the university to expand this relationship.”

Operation of the NASA-owned communication equipment, consisting of three antennas (AS-1, 2 & 3), is the responsibility of the university. The 24-hour-a-day, seven-day-a-week services provide downlink, uplink and coherent tracking to support launches, early orbits and routine on-orbit operations. Development, building and verification testing of NASA’s newest antenna were completed just in time to support the launch of the Orbiting Carbon Observatory on July 2.

With AS-3 in operation, the NEN’s capabilities have expanded. “From the beginning of this project the university has been very supportive,” said David Carter, [NEN](#) project manager. “The entire team did a great job, especially with the challenges of the arctic weather to complete site preparations, antenna installation and site acceptance testing. This addition will allow NASA to expand its Near Earth Network capabilities, providing more flexibility in support of current and future missions.”

The partnership between NASA and the university began more than 20 years ago with the installation of NASA’s first antenna at the site. “To see the number of people here today shows the enthusiasm we have for this partnership,” said Brian Rogers, UAF chancellor. “Thanks to all of you for being here, thanks to NASA for continuing this partnership and for caring about the growth of science, technology, engineering and mathematics.”

The NEN provides telemetry, tracking and command services to an extensive and diverse customer base of approximately 35 missions. They include the high-rate Earth Observing System, Aqua, Aura and QuikSCAT; and Small Explorer missions such as SWIFT, AIM, IRIS and NuStar. The network provides

TT&C services for orbiting satellites with periodic passes that average 140 per day. The NEN also supports orbiting satellites through short duration communications services. These missions require daily and sometimes hourly contact.

Comprised of NASA-owned and commercial tracking stations, the NEN is located throughout the world. Network assets owned by NASA are located at Wallops Flight Facility in Virginia; McMurdo Ground Station in Antarctica; White Sands Complex, in New Mexico. Owned by NASA, but operated by UAF, is the Fairbanks facility.

NASA’s Space Communications and Navigation Program, part of the Human Exploration and Operations Mission Directorate at the agency’s Headquarters in Washington, is responsible for all of NASA’s space communication activities. The NEN is managed, operated and maintained at NASA’s Goddard Space Flight Center. Team members are located at the Greenbelt, Maryland and Wallops Flight Facility, Virginia campuses.

The NEN is currently augmenting its ground station network to provide communication services for future spacecraft. Future users will include NASA’s newest heavy lift vehicle, the Space Launch System, and the Orion Multi-Purpose Crew Vehicle. ■

Opposite: One of three of NASA’s newest antennas, AS-3 on part of the University of Alaska–Fairbanks. Photo credit: NASA/Goddard/Dewayne Washington.

Below: A ribbon cutting ceremony was held at the base of NASA’s newest antenna for the Near Earth Network. Photo credit: NASA/Goddard/Dewayne Washington





NASA'S HIGH-FLYING LASER ALTIMETER TO CHECK OUT SUMMER SEA ICE AND MORE

By: [Kate Ramsayer](#)

Sea ice in summer looks dramatically different than sea ice in winter, even in the polar Arctic. Summer snowmelt, pools of water on thinning ice and exposed ocean replace vast winter expanses of white snow-covered ice—and this past weekend, NASA's high-flying laser altimeter began a campaign to investigate these features.

Icy areas look different from a satellite's perspective as well. When NASA launches the Ice, Cloud and land Elevation Satellite-2, or ICESat-2, in 2017, it will measure Earth's elevation by sending out pulses of green laser light and timing how long it takes individual photons to bounce off Earth's surface and return. The number and patterns of photons that come back depend on the type of ice they bounce off—whether it's smooth or rough, watery or snow-covered.

To get a preview of what summertime will look like to [ICESat-2](#), NASA scientists, engineers and pilots have travelled to Fairbanks, Alaska, to fly an airborne test bed instrument called the Multiple Altimeter Beam Experimental Lidar, or MABEL. MABEL collects data in the same way that ICESat-2's instrument will—with lasers and photon-detectors. So the data from the Alaskan campaign will allow researchers to develop computer programs, or algorithms, to analyze the information from ICESat-2.

"We need to give scientists data to enable them to develop algorithms that work during summer," said Thorsten

Markus, ICESat-2's project scientist at NASA's Goddard Space Flight Center in Greenbelt, Maryland. "All the algorithms need to be tested and in place by the time of launch. And one thing that was missing was ICESat-2-like data on the summer conditions."

Between July 12 and August 1, MABEL will fly aboard NASA's high-altitude ER-2 aircraft as the Arctic sea ice and glaciers are melting. In its half-dozen flights, the instrument will take measurements of the sea ice and Alaska's southern glaciers, as well as forests, lakes, open ocean, the atmosphere and more, sending data back to researchers on the ground.

A key element of the campaign, however, is to fly over melt ponds—areas where snow has melted, pooling up in low spots of the sea ice or glaciers—and bare ice with no snow coverage to find out how to identify and study these features with ICESat-2-like data.

Scientists have many questions about melt ponds, and their impact on the extent of summer ice melt. Dark water absorbs much more heat from the sun than bright, reflective ice and snow, so when a pool of liquid water forms on top of ice, it changes the heat balance. The water warms up in the summer sun, and can speed up melting of the surrounding ice, possibly influencing the Arctic Ocean's sea ice minimum extent.

"The melt pond coverage may be an indicator of the ice coverage at the end of the summer," said Ron Kwok, a senior research scientist at NASA's Jet Propulsion Laboratory in Pasadena, California. "But we don't have a lot of information about melt pond coverage over the Arctic." Although scientists know the ponds are present, and cover a lot of area, they don't know how the number, size and depth vary from year to year, and region to region, said Kwok, also a member of the ICESat-2 Science Definition Team who is developing sea ice algorithms.

Melt ponds can also tell researchers about the sea ice itself, Kwok said. Deeper, smaller ponds can form on the bumpy and ridged older ice, which has withstood multiple years in the Arctic Ocean. Newer ice—ice that formed the winter before—hasn't had the time to build up ridges, and so would be flat and covered with large shallow ponds. "In the summer, we can tell whether it's first year ice or older, based roughly on the shape and size of the melt ponds," Kwok said.

The MABEL flights will allow researchers to determine what those ponds and melting snow will look like from ICESat-2, and how to best analyze the returning photons. The ponds could be tricky to study, he said, since some photons might reflect off the surface, while others could make it through the water to bounce off the bottom of the pond.

"We have to design the algorithms to adapt to what we're learning this summer," Kwok said. "We don't have any preconceived notions as to what we might see, and that's why it's so important to fly MABEL."

The flight plans for the ER-2 carrying MABEL involve a route that would take it north, possibly over the North Pole, to look at a variety of sea ice conditions, as well as some ice fields north of Fairbanks, said Bill Cook, MABEL's lead scientist. The aircraft will also fly above forests, along some of the same paths of another NASA campaign that is flying Goddard's LiDAR, Hyperspectral and Thermal Imager, or G-LiHT, just above the treetops. Researchers will be able to then compare the data from MABEL and [G-LiHT](#), Cook noted.

With 48 hours of flying time available, he said, the first priority are the flights north toward the pole to see how different the summer ice looks to MABEL.

Follow MABEL on its [blog](#). ■

Above: This summer, the Multiple Altimeter Beam Experimental Lidar, or MABEL, will fly above Alaska and the Arctic Ocean on one of NASA's ER-2 high-altitude aircraft. Photo credit: NASA/Carla Thomas

By day, Scott Glubke is a division chief engineer at NASA's Goddard Space Flight Center in Greenbelt, MD. In the evenings he is a craft beer enthusiast and homebrewer. Glubke is the president of Zymurnauts, a GEWA (Goddard Employees Welfare Association) club for home brewers at NASA's Goddard Space Flight Center in Greenbelt, Maryland. Homebrewing is the hobby of fermenting beer at home for small-scale consumption.

"Like pancakes, there's three different ways you can make beer," says Glubke. He says you can purchase a kit from a store that only requires you to add water, you can use a mixture of both raw and processed ingredients, or you can make the brew completely from scratch. Glubke makes his home brew using the second method. He enjoys teaching others how to homebrew as well.

Glubke has worked at Goddard for 29 years. He founded the Zymurnauts club 10 years ago. Glubke named the club by combining the words astronaut and zymurgy, the study of yeast. Zymurnauts has more than 50 members, a combination of brewers and non-brewers.

Glubke was inspired to start the club after he realized there were other employees at NASA who were interested in homebrewing. He is a beer enthusiast and became interested in homebrewing 20 years ago.

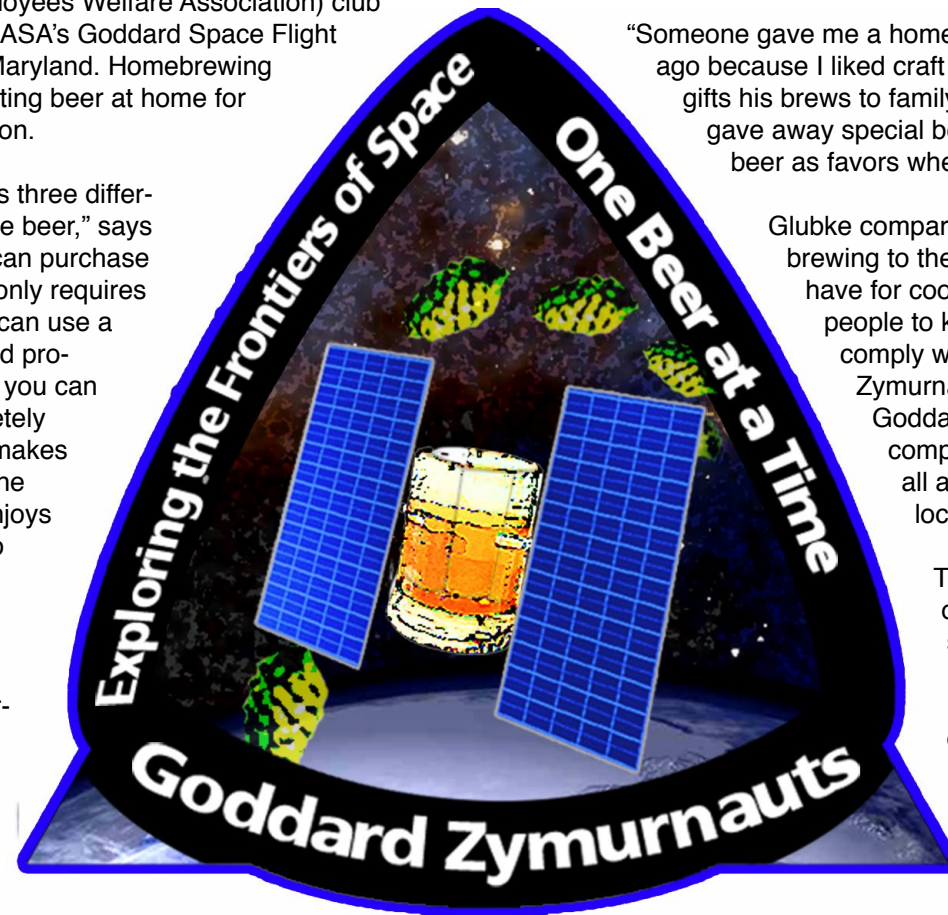
"Someone gave me a homebrew kit about 18 years ago because I liked craft beer," he says. Glubke gifts his brews to family and friends. He even gave away special bottles of his homemade beer as favors when he got married in 2001.

Glubke compares his passion for homebrewing to the passion some people have for cooking or dancing. He wants people to know that Zymurnauts comply with all legal requirements. Zymurnauts conducts meetings at Goddard to discuss events and competitions. The club holds all alcohol-related events at locations off center.

The Zymurnauts meet once a month and hold several events throughout the year. The group hosts picnics in the spring, a club brew day in July, and a brew competition in April. Zymurnauts is part of the American Home Brewers Association and Maryland Homebrewers Guild.

The club interacts with home brew clubs in the Washington and Baltimore area.

If you would like to learn more about the Zymurnaut you can contact [Scott Glubke](#). ■



GODDARD ZYMURNAUTS ENGINEER MORE THAN JUST SPACECRAFT

By: [Angel Mills](#)

MESSENGER AND STEREO OPEN NEW WINDOW INTO HIGH- ENERGY PROCESSES ON SUN

By [Karen C. Fox](#)

Understanding the sun from afar isn't easy. How do you figure out what powers solar flares—the intense bursts of radiation coming from the release of magnetic energy associated with sunspots—when you must rely on observing only the light and particles that make their way to near-Earth's orbit?

One answer: you get closer. NASA's MESSENGER spacecraft—which orbits Mercury, and so is as close as 28 million miles from the sun versus Earth's 93 million miles—is near enough to the sun to detect solar neutrons that are created in solar flares. The average lifetime for one of these neutrons is only 15 minutes. How far they travel into space depends on their speed, and slower neutrons don't travel far enough to be seen by particle detectors in orbit around Earth. Results showing that [MESSENGER](#) has likely observed solar neutrons appeared in the Journal of Geophysical Research: Space Physics on July 9, 2014.

"To understand all the processes on the sun we look at as many different particles coming from the sun as we can—photons, electrons, protons, neutrons, gamma rays—to gather different kinds of information," said David Lawrence, first author of the paper at The Johns Hopkins Applied Physics Lab in Laurel, Maryland. "Closer to Earth we can observe charged particles from the sun, but analyzing them can be a challenge as their journey is affected by magnetic fields."

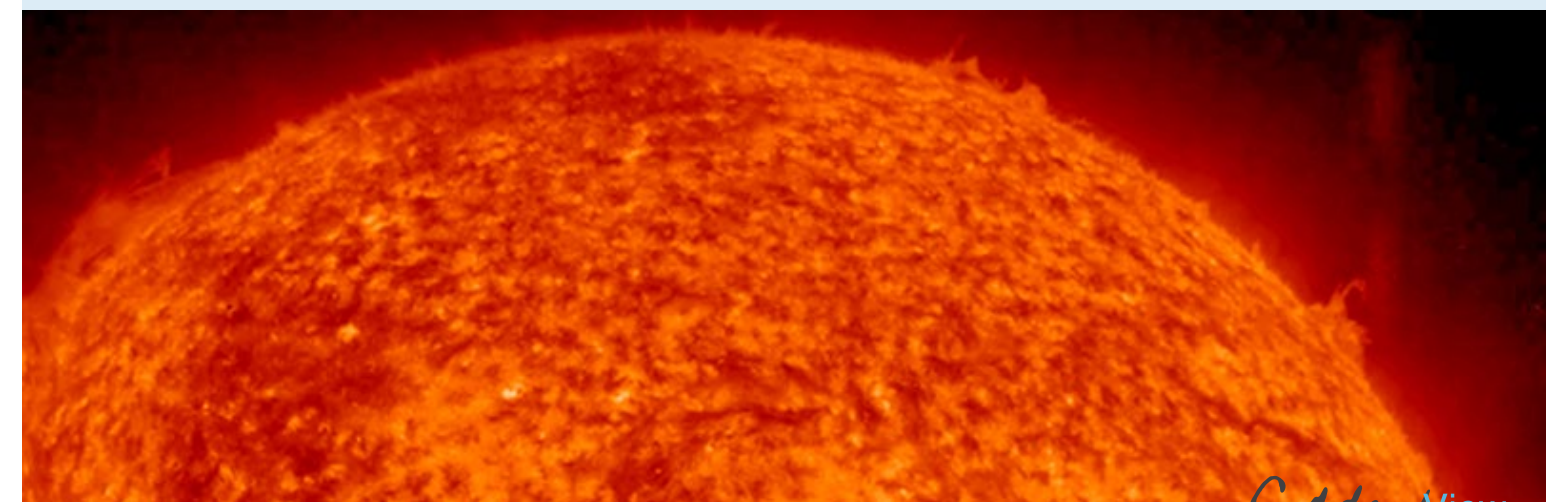
Such charged particles twirl and gyrate around the magnetic field lines created by the vast magnetic systems that surround the sun and Earth. Neutrons, however, as they are not electrically charged, travel in straight lines from the flaring region. They can carry information about flare processes unperturbed by the environment through which they move. This informa-

tion can be used by scientists to decipher one aspect of the complicated acceleration processes that are responsible for the creation of highly energetic and fast solar particles.

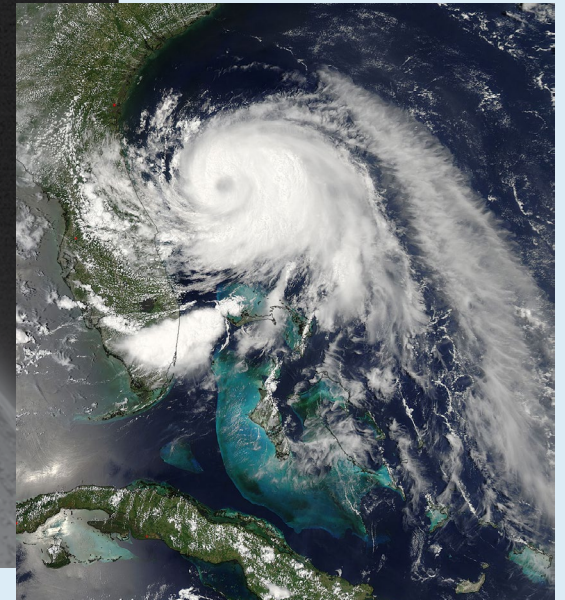
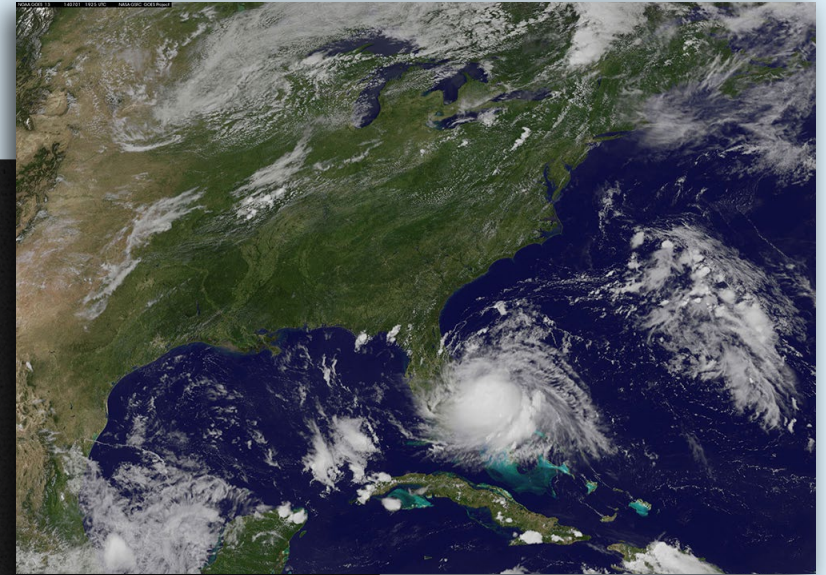
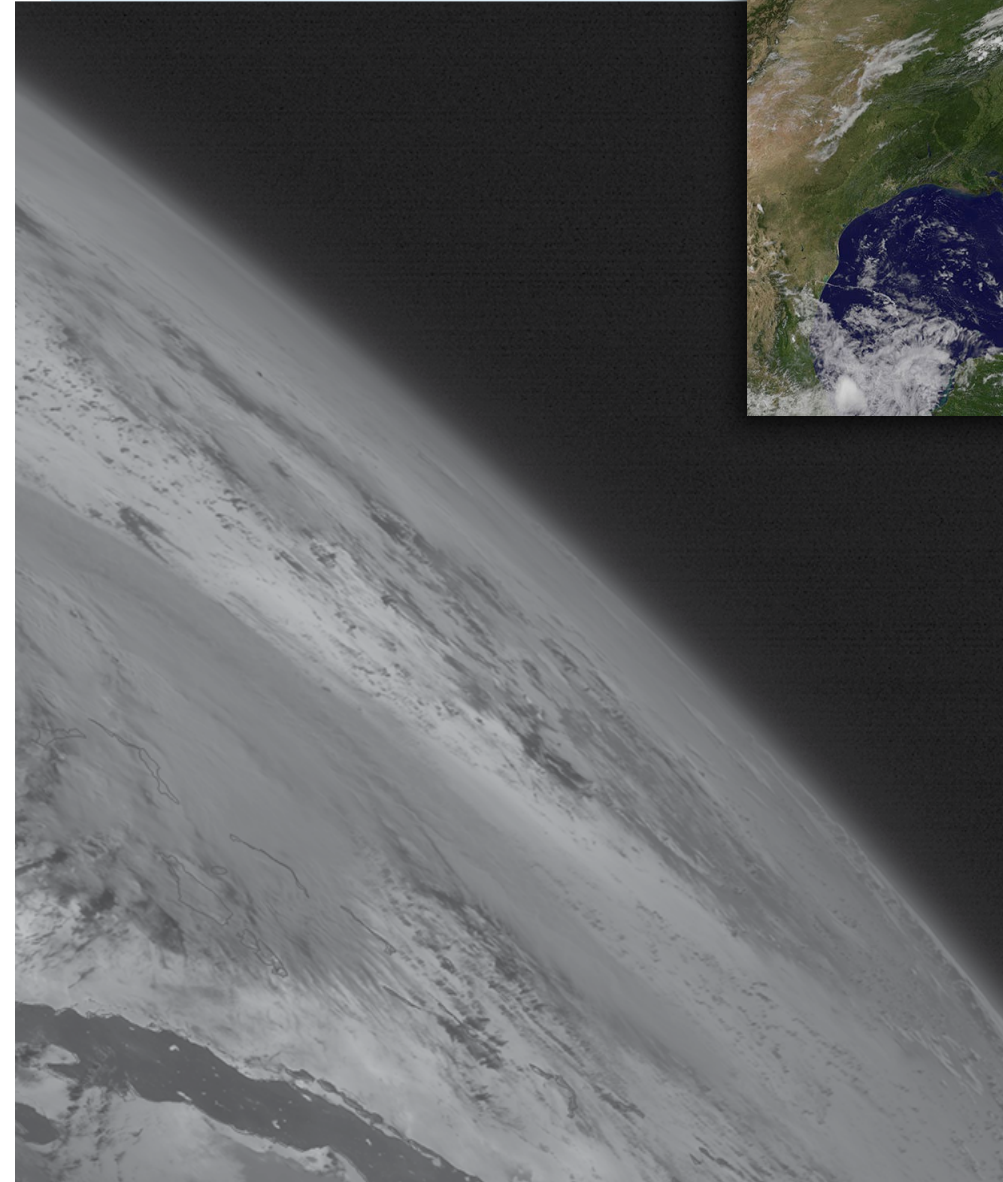
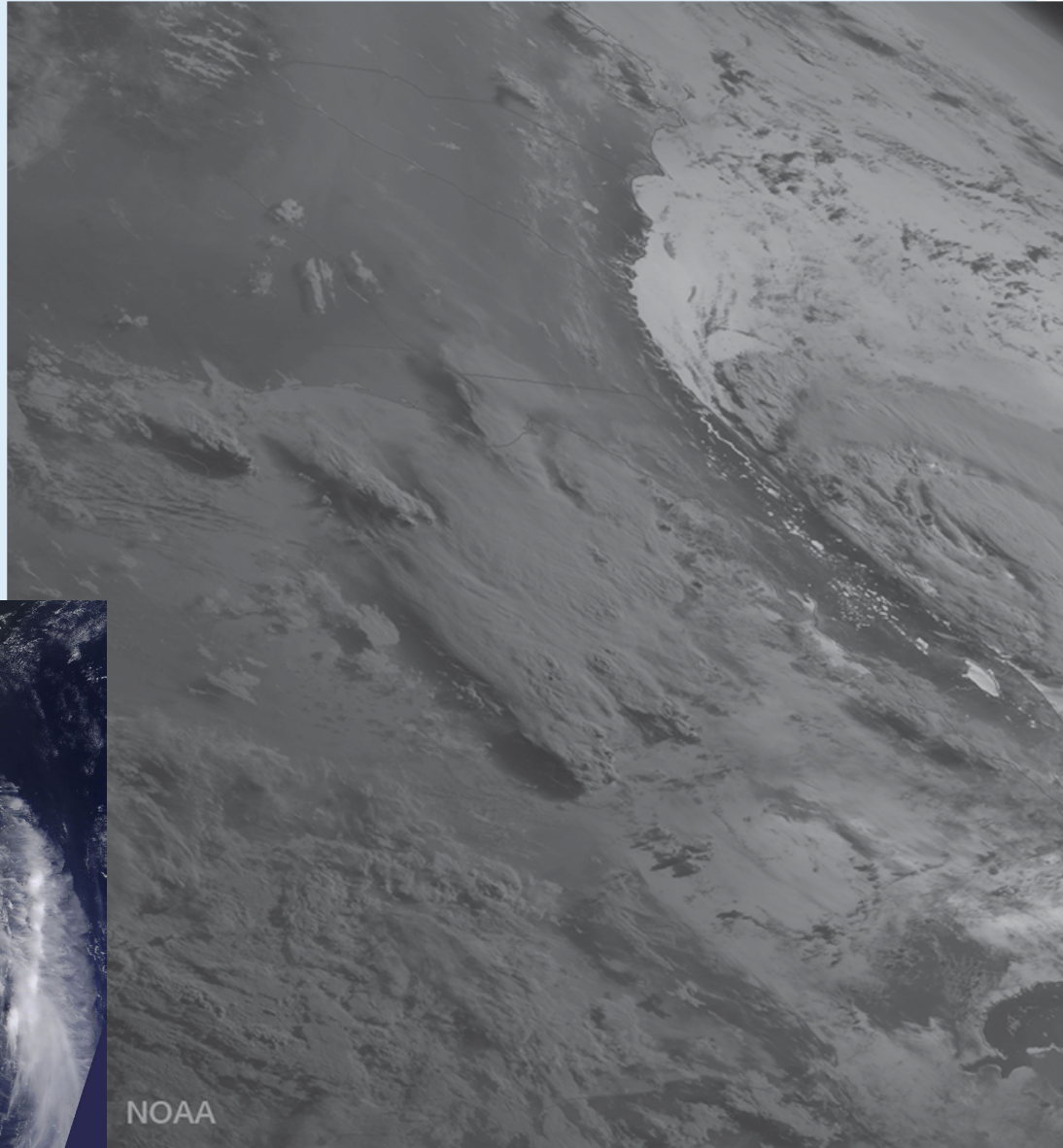
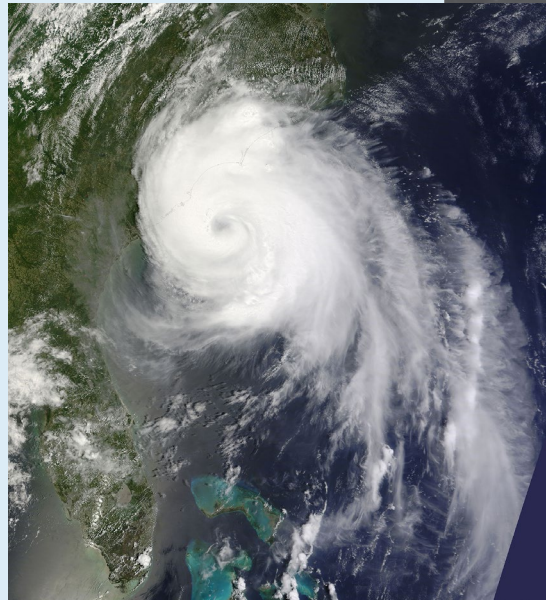
Lawrence and his team looked at MESSENGER data from June 4 and 5, 2011, corresponding to solar flares that were accompanied by fast-moving, energetic charged particles. The flare occurred on the far side of the sun so Earth-based views of the flare region could not be obtained. However, a solar telescope on NASA's Solar Terrestrial Relations Observatory, or STEREO, spacecraft did have a clear view of the far-side flare region. [STEREO](#) provided useful observations of the flare. This combined use of NASA mission data makes each individual mission more effective in addressing unsolved science questions.

The MESSENGER data showed an increase in the number of—not electrically charged—neutrons at Mercury's orbit hours before the large number of charged particles reached the spacecraft. This indicated that the neutrons were most likely produced by accelerated flare particles striking the lower solar atmosphere, releasing neutrons as a result of high-energy collisions. So, together, the MESSENGER and STEREO data can provide new information about how particles are accelerated in solar flares. ■

Below: A solar flare erupted on the far side of the sun on June 4, 2011, and sent solar neutrons out into space. Solar neutrons don't make it to all the way to Earth, but NASA's MESSENGER, orbiting Mercury, found strong evidence for the neutrons, offering a new technique to study these giant explosions. Image credit: NASA/STEREO/Heliviewer



NASA SATELLITES CAPTURE ARTHUR



Several satellites tracked hurricane Arthur as it formed from a tropical storm. These images were captured by NASA and NOAA.

Center: Arthur Strengthens, Moves Northward
This image was taken by GOES West at the far eastern periphery of its scan, at 1200Z on July 2, 2014. Image credit: [NOAA/NASA GOES Project](#).

Left: Hurricane Arthur off the Carolinas
The National Hurricane Center in Miami says Arthur is centered about 260 miles southwest of Cape Hatteras, North Carolina, and about 110 miles south-southwest of Cape Fear. It's moving north at 14 mph. Captured on Friday, July 3, 2014 by Terra. Image credit: NASA/GSFC/Jeff Schmaltz/[MODIS Land Rapid Response Team](#)

Top right: Tropical Storm Arthur Forms
This image was taken by GOES East at 1445Z on July 1, 2014. Image credit: NOAA/NASA GOES Project

Right: NASA Sees Hurricane Arthur's Cloud-Covered Eye
This visible image of Tropical Storm Arthur was taken by the MODIS instrument aboard NASA's Aqua satellite on July 2 at 18:50 UTC (2:50 p.m. EDT). A cloud-covered eye is clearly visible. Image credit: NASA Goddard MODIS Rapid Response Team ■

OUTSIDE GODDARD

By: Elizabeth M. Jarrell

Accidental Beauty

Not many people see beauty in metal ducting. After only four years of taking photos, Andrew Wohl is now selling his photographs, which he has exhibited in juried art shows and sold for hundreds of dollars. His is an original and unique vision of the world.

"I see the industrial design in the world," said Wohl, a mechanical engineer at NASA's Goddard Space Flight Center in Greenbelt, Maryland. "I see the abstract, continuous, undulating lines."

About four years ago, Wohl received a point-and-shoot camera as a surprise birthday gift. He started carrying the pocket camera everywhere. Two years ago, he received a digital single lens reflex camera. He joined Goddard's photography club, attending meetings and taking a few courses.

"With my mechanical engineering background, I like to think about all the beautiful things I could design—simple, elegant mechanisms with a clean design," said Wohl. "I'm more and more interested in industrial design, blending engineering with design."

Although Wohl has no formal training in photography or art, he grew up in a house filled with paintings and sculptures done by his father's side of the family. His father, a property manager, took him to all kinds of industrial sites, developing his eye for industrial design, making him aware of machinery and shapes. When he was in engineering school, he studied in the art library where, to relax, he would flip through the art books lying about.

Wohl is inspired by another mechanical engineer, Alexander Calder, whose large mobiles hang at museums throughout the world including the National Gallery of Art in Washington, D.C. Wohl's other heroes include industrial designers Marc Newson and Karim Rashid. Wohl obsessively downloads the work of certain photographers including Grant Mudford and Lewis Baltz, both of whom use very strong, architectural geometry while remaining minimalists.

Wohl's house is now full of photos, his and others. He designs furniture, including a multi-level coffee table he reconfigured out of stackable metal shelving. He always asks himself, "Why wasn't this designed like that before?"

"The purest example of great industrial design is a metal ring four inches in diameter that replaces the ugly, square cardboard Kleenex box. The ring is both functional and beautiful, the essence of intelligent design—it is genius. I'm not talking just about pretty things. Making something work better enhances its beauty," said Wohl.

Wohl focuses on the buildings and pieces of buildings, looking for interesting geometric shapes, shadows and textures. He always works outside. He never photographs an entire building, only a small part of it. His subjects are the abstract details of objects designed to be functional—pipes, ductwork, even the texture of a building façade.

He recently led a photo safari around Goddard to introduce the photography club members to his interest in the architecture and machinery at Goddard. Most of his photos, including one of metal ducting, are taken near the building 7/10/15/29 complex where he works.

"For the metal ducting photograph, I kept returning to look at the pipes, waiting for the perfect light. I wanted just the right amount of shadow to highlight the elegance of the design. I love the accidental beauty in things designed by engineers where beauty is not the goal," said Wohl.

His pieces have been exhibited throughout the region, including at juried shows at Strathmore Hall in North Bethesda, Maryland, and at the Kentlands Mansion in Gaithersburg, Maryland. In the fall of 2014, Strathmore Hall will devote an entire room to his work.

"I consider my photographs to be found still lifes that examine the interaction between members of a group and the struggle to be an individual. What began as an appreciation for the beauty found in the orderly arrangement of common objects has blossomed into a rich understanding of my interest in relationships, societal roles, the desire to belong and the quest to be unique," explained Wohl. ■

Center: Wohl captures beauty in everyday, often overlooked things like this metal ductwork at Goddard. Photo courtesy of A. Wohl

